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The effects of incident electric fields on counterflow diffusion flames.[1] MARIO DI RENZO, PIETRO DE PALMA, MARCO DONATO DE TULLIO, GIUSEPPE PASCAZIO, Univ Politecnico di Bari, JAVIER URZAY, Stanford University — The impingement of electric fields on flames is known to have potential for mitigating combustion instabilities, enhancing flame propagation and decreasing pollutant emissions. A computational analysis of counterflow methane-oxygen laminar diffusion flames impinged by electric fields is performed in this work using axisymmetric numerical simulations, complex transport and a detailed chemistry mechanism. The electric field steers the charged intermediate species, which exchange momentum with the rest of the gas, thereby changing the flow around the flame and creating an ionic wind whereby anions and cations flow towards the corresponding electrodes. As a result, the aerothermal field and scalar dissipation rate undergo variations that may be of significance for the subgrid-scale modeling of turbulent flames subject to electric fields. The results are found to agree well with previous experiments.

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